

**FINAL JEE-MAIN EXAMINATION – JUNE, 2022**

**(Held On Monday 27<sup>th</sup> June, 2022)**

**TIME : 9 : 00 AM to 12 : 00 PM**

**CHEMISTRY**

**TEST PAPER WITH SOLUTION**

**SECTION-A**

1. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**

**Assertion (A) :** At 10°C, the density of a 5M solution of KCl [atomic masses of K and Cl are 39 & 35.5 g mol<sup>-1</sup>]. The solution is cooled to -21°C. The molality of the solution will remain unchanged.

**Reason (R) :** The molality of a solution does not change with temperature as mass remains unaffected with temperature.

In the light of the above statements, choose the correct answer from the options given below:

- (A) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**  
 (B) Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**  
 (C) **(A)** is true but **(R)** is false  
 (D) **(A)** is false but **(R)** is true

**Official Ans. by NTA (A)**

**Ans. (A)**

- Sol.** Molality is independent of temperature and hence both assertion and reason are true.

2. Based upon VSEPR theory, match the shape (geometry) of the molecules in List-I with the molecules in List-II and select the most appropriate option

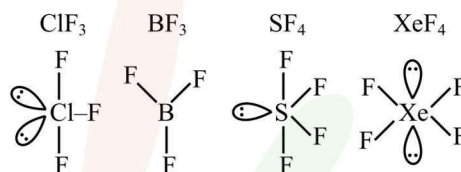
List-I (Shape)	List-II (Molecules)
(A) T-shaped	(I) XeF <sub>4</sub>
(B) Trigonal planar	(II) SF <sub>4</sub>
(C) Square planar	(III) ClF <sub>3</sub>
(D) See-saw	(IV) BF <sub>3</sub>

- (A) (A) – I, (B) – (II), (C) – (III), (D) – (IV)  
 (B) (A) – (III), (B) – (IV), (C) – (I), (D) – (II)  
 (C) (A) – (III), (B) – (IV), (C) – (II), (D) – (I)  
 (D) (A) – (IV), (B) – (III), (C) – (I), (D) – (II)

**Official Ans. by NTA (B)**

**Ans. (B)**

**Sol.**



3. Match List-I with List-II

	List-I	List-II
(A)	Spontaneous process	(I) $\Delta H < 0$
(B)	Process with $\Delta P = 0$ , $\Delta T = 0$	(II) $\Delta G_{T,P} < 0$
(C)	$\Delta H_{\text{reaction}}$	(III) Isothermal and isobaric process
(D)	Exothermic process	(IV) [Bond energies of molecules in reactants] - [Bond energies of product molecules]

Choose the correct answer from the options given below:

- (A) (A) – (III), (B) – (II), (C) – (IV), (D) – (I)  
 (B) (A) – (II), (B) – (III), (C) – (IV), (D) – (I)  
 (C) (A) – (II), (B) – (III), (C) – (I), (D) – (IV)  
 (D) (A) – (II), (B) – (I), (C) – (III), (D) – (IV)

**Official Ans. by NTA (B)**

**Ans. (B)**

- Sol.** (A) For a spontaneous process  $\Delta G_{T,P} < 0$

(B)  $\Delta P = 0 \rightarrow$  Isobaric process

$\Delta T = 0 \rightarrow$  Isothermal process

(C)  $\Delta H_{\text{reaction}} = (\Sigma \text{Bond energies of reactants}) - (\Sigma \text{bond energies of products})$

(D)  $\Delta H < 0$  is for exothermic reaction

4. Match List-I with List-II

List-I	List-II
(A) Lyophilic colloid	(I) Liquid-liquid colloid
(B) Emulsion	(II) protective colloid
(C) Positively charged	(III) $\text{FeCl}_3 + \text{NaOH}$
(D) Negatively charged colloid	(IV) $\text{FeCl}_3 + \text{hot water}$

Choose the correct answer from the options given below:

- (A) (A) – (II), (B) – (I), (C) – (IV), (D) – (III)  
 (B) (A) – (III), (B) – (I), (C) – (IV), (D) – (II)  
 (C) (A) – (II), (B) – (I), (C) – (III), (D) – (IV)  
 (D) (A) – (III), (B) – (II), (C) – (I), (D) – (IV)

**Official Ans. by NTA (A)**

**Ans. (A)**

- Sol.** (A) Protective colloids are lyophilic colloids  
 (B) Emulsions are liquid in liquid colloidal solutions  
 (C)  $\text{FeCl}_3 + \text{hot water}$  forms positively charged colloidal solution of hydrated ferric oxide.  
 (D)  $\text{FeCl}_3 + \text{NaOH}$  forms negatively charged colloidal solution due to preferential adsorption of  $\text{OH}^-$  ions
5. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason(R)

**Assertion (A):** The ionic radii of  $\text{O}^{2-}$  and  $\text{Mg}^{2+}$  are same.

**Reason (R) :** Both  $\text{O}^{2-}$  and  $\text{Mg}^{2+}$  are isoelectronic species

In the light of the above statements, choose the correct answer from the options given below

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)

(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(C) (A) is true but (R) is false

(D) (A) is false but (R) is true

**Official Ans. by NTA (D)**

**Ans. (D)**

**Sol.** Ionic radius of  $\text{O}^{2-}$  is more than that of  $\text{Mg}^{2+}$   
 Both  $\text{O}^{2-}$  and  $\text{Mg}^{2+}$  are isoelectronic with 10 electrons

6. Match List-I with List-II

List-I	List-II
(A) Concentration of gold ore	(I) Aniline
(B) Leaching of alumina	(II) NaOH
(C) Froth stabiliser	(III) $\text{SO}_2$
(D) Blister copper	(IV) NaCN

Choose the correct answer from the options given below.

- (A) (A) – (IV), (B) – (III), (C) – (II), (D) – (I)  
 (B) (A) – (IV), (B) – (II), (C) – (I), (D) – (III)  
 (C) (A) – (III), (B) – (II), (C) – (I), (D) – (IV)  
 (D) (A) – (II), (B) – (IV), (C) – (III), (D) – (I)

**Official Ans. by NTA (B)**

**Ans. (B)**

**Sol.** Gold is concentrated by cyanidation  
 Leaching of alumina is done by NaOH  
 Froth stabiliser is aniline  
 Blister copper has condensed  $\text{SO}_2$  on the surface

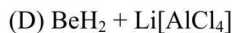
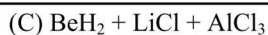
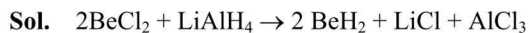
7. Addition of  $\text{H}_2\text{SO}_4$  to  $\text{BaO}_2$  produces:  
 (A) BaO,  $\text{SO}_2$  and  $\text{H}_2\text{O}$  (B)  $\text{BaHSO}_4$  and  $\text{O}_2$   
 (C)  $\text{BaSO}_4$ ,  $\text{H}_2$  and  $\text{O}_2$  (D)  $\text{BaSO}_4$  and  $\text{H}_2\text{O}_2$

**Official Ans. by NTA (D)**

**Ans. (D)**

**Sol.**  $\text{BaO}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + \text{H}_2\text{O}_2$   
 This is a common method to prepare hydrogen peroxide

8.  $\text{BeCl}_2$  reacts with  $\text{LiAlH}_4$  to give  
 (A)  $\text{Be} + \text{Li}[\text{AlCl}_4] + \text{H}_2$   
 (B)  $\text{Be} + \text{AlH}_3 + \text{LiCl} + \text{HCl}$

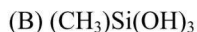
**Official Ans. by NTA (C)****Ans. (C)**This is the method to prepare  $\text{BeH}_2$ **9.** Match List-I with List-II

List-I

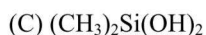
List-II

**(Si-Compounds)****(Si-Polymeric/other products)**

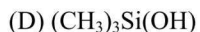
(I) Chain silicone



(II) Dimeric silicone

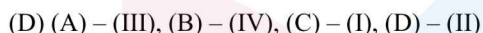
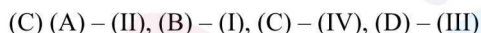
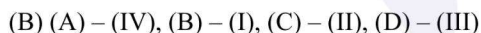
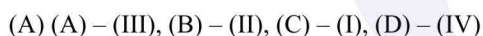
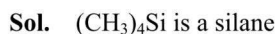
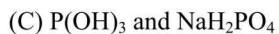
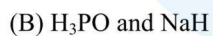
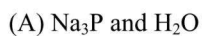
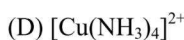
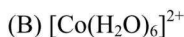
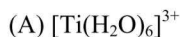


(III) Silane



(IV) 2D - Silicone

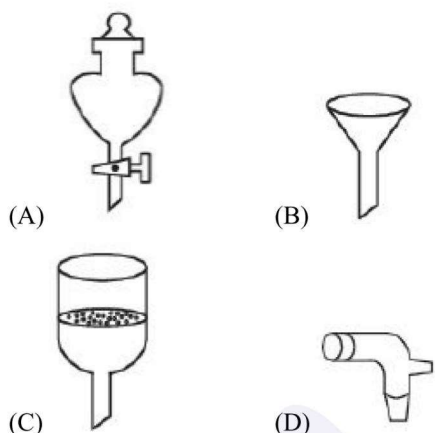
Choose the correct answer from the options given below:

**Official Ans. by NTA (D)****Ans. (D)** $(\text{CH}_3)\text{Si}(\text{OH})_3$  polymerise to form 2D silicone $(\text{CH}_3)_2\text{Si}(\text{OH})_2$  polymerise to form chain silicone $(\text{CH}_3)_3\text{Si}(\text{OH})$  form dimer  $(\text{CH}_3)_3\text{Si-O-Si}(\text{CH}_3)_3$ **10.** Heating white phosphorus with conc. NaOH solution gives mainly**Official Ans. by NTA (D)****Ans. (D)****11.** Which of the following will have maximum stabilization due to crystal field?**Official Ans. by NTA (C)****Ans. (C)****Sol.**  $\text{Co}^{3+}$  has maximum effective nuclear charge and  $\text{CN}^-$  is the strongest ligand in the given options**12.** Given below are two statements:**Statement I:** Classical smog occurs in cool humid climate. It is a reducing mixture of smoke, fog and sulphur dioxide**Statement II:** Photochemical smog has components, ozone, nitric oxide, acrolein, formaldehyde, PAN etc.In the light of above statements, choose the **most appropriate** answer from the options give below(A) Both **Statement I** and **Statement II** are correct(B) Both **Statement I** and **Statement II** are incorrect(C) **Statement I** is correct but **statement II** is incorrect(D) **Statement I** is incorrect but **Statement II** is correct**Official Ans. by NTA (A)****Ans. (A)****Sol.** Classical smog occurs in cool humid climate. It is a reducing mixture of smoke, fog and sulphur dioxide

Photochemical smog has components, ozone, nitric oxide, acrolein, formaldehyde, PAN etc.



13. Which of the following is structure of a separating funnel?

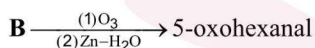
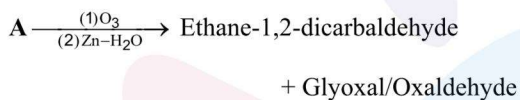


Official Ans. by NTA (A)

Ans. (A)

Sol. It is used to separate liquid-liquid mixture which is immiscible with different densities

14. 'A' and 'B' respectively are:

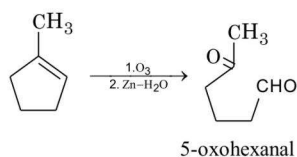
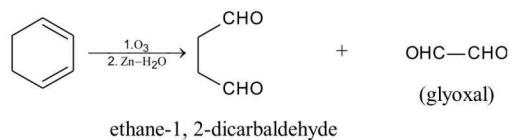


- (A) 1-methylcyclohex-1, 3-diene & cyclopentene
- (B) Cyclohex-1, 3-diene & cyclopentene
- (C) 1-methylcyclohex-1,4-diene & 1-methylcyclopent-1-ene
- (D) Cyclohex-1,3-diene & 1-methylcyclopent-1-ene

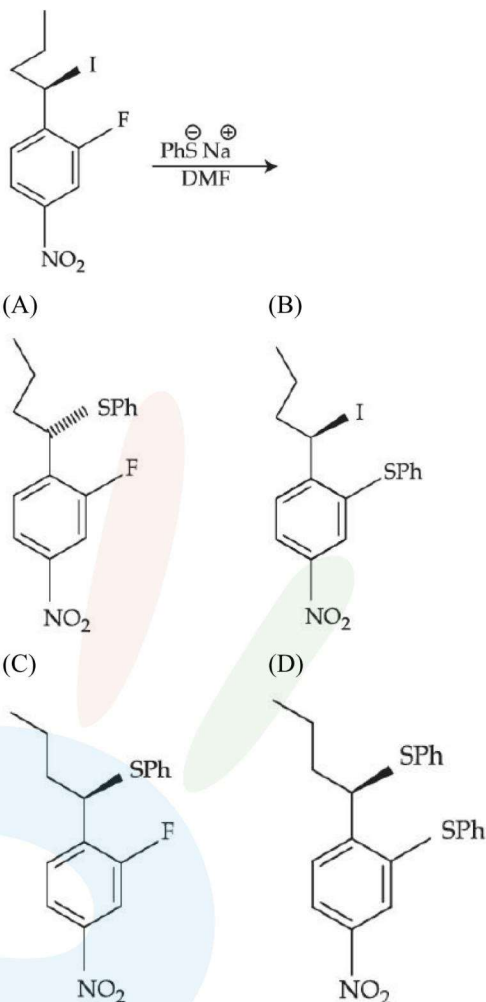
Official Ans. by NTA (D)

Ans. (D)

Sol.



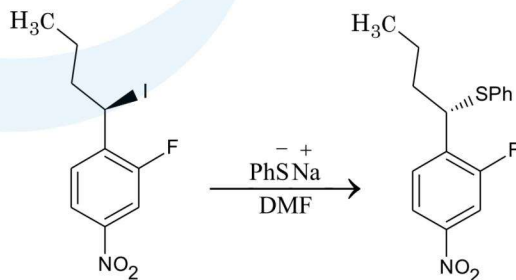
15. The major product of the following reaction is:



Official Ans. by NTA (A)

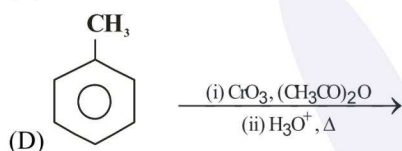
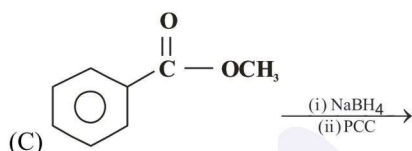
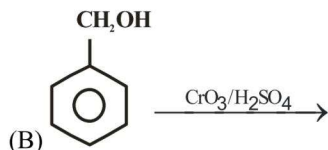
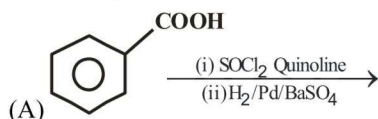
Ans. (A)

Sol.



It is bimolecular nucleophilic substitution ( $SN^2$ ) which occur at benzylic carbon by inversion in configuration. This reaction cannot undergo substitution at benzene ring

16. Which of the following reactions will yield benzaldehyde as a product?

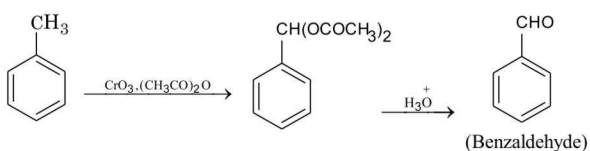
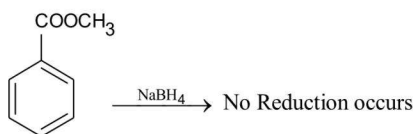
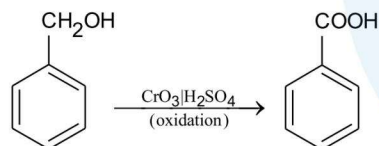
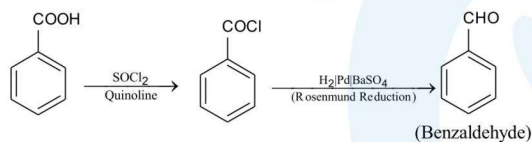


- (A) (B) and (C)                      (B) (C) and (D)  
(C) (A) and (D)                      (D) (A) and (C)

Official Ans. by NTA (C)

Ans. (C)

Sol.



17. Given below are two statements:

**Statements-I :** In Hofmann degradation reaction, the migration of only an alkyl group takes place from carbonyl carbon of the amide to the nitrogen atom.

**Statement-II :** The group is migrated in Hofmann degradation reaction to electron deficient atom.

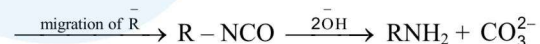
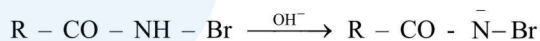
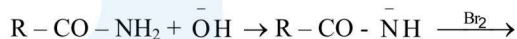
In the light of the above statement, choose the **most appropriate** answer from the options given below:

- (A) Both **Statement-I** and **Statement-II** are correct  
(B) Both **Statement-I** and **Statement-II** are incorrect  
(C) **Statement-I** is correct but **Statement-II** is incorrect  
(D) **Statement-I** is incorrect but **Statement-II** is correct

Official Ans. by NTA (D)

Ans. (D)

Sol.  $R - CO - NH_2 + Br_2 + NaOH \rightarrow$



In this reaction of alkyl as well as aryl group can migrate to electron deficient nitrogen atom.

18. Match List-I with List-II

List-I

List-II

(Polymer)

(Used in)

(A) Bakelite

(I) Radio and television

Cabinets

(B) Glyptal

(II) Electrical switches

(C) PVC

(III) Paints and Lacquers

(D) Polystyrene

(IV) Water pipes

Choose the correct answer from the options given below:

- (A) (A) – (II), (B) – (III), (C) – (IV), (D) – (I)  
 (B) (A) – (I), (B) – (II), (C) – (III), (D) – (IV)  
 (C) (A) – (IV), (B) – (III), (C) – (II), (D) – (I)  
 (D) (A) – (II), (B) – (III), (C) – (I), (D) – (IV)

Official Ans. by NTA (A)

Ans. (A)

Sol. Bakelite- It is thermosetting polymer used for making electrical switches.

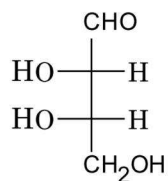
Glyptal – manufacture of paints and lacquers

PVC – manufacture of water pipes, rain coats, hand bags

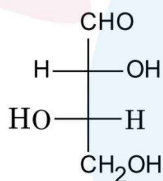
Polystyrene – manufacture of radio and television cabinets

19. L-isomer of a compound 'A' ( $C_4H_8O_4$ ) gives a positive test with  $[Ag(NH_3)_2]^+$ . Treatment of 'A' with acetic anhydride yield triacetate derivative. Compound 'A' produces an optically active compound (B) and an optically inactive compound (C) on treatment with bromine water and  $HNO_3$  respectively, compound (A) is:

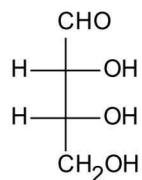
(A)



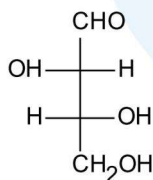
(B)



(C)



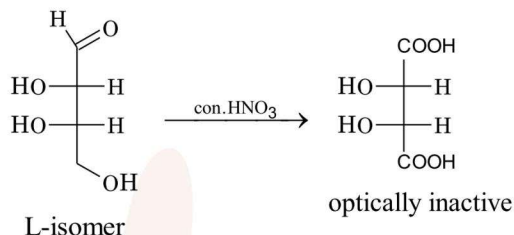
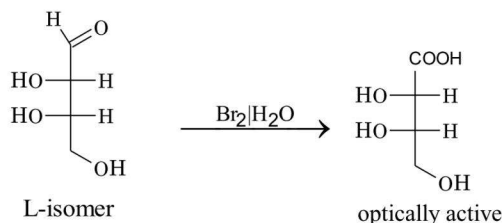
(D)



Official Ans. by NTA (A)

Ans. (A)

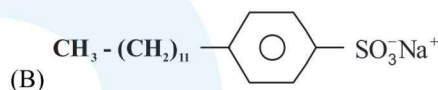
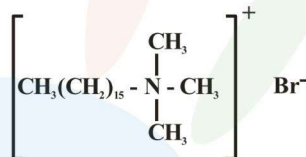
Sol.



20. Match List-I with List-II

List-I

(A)



(C)  $C_{17}H_{35}COO^-Na^+ + Na_2CO_3 + \text{Rosinate}$

(D)  $\text{CH}_3(\text{CH}_2)_{16}\text{COO}(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{CH}_2\text{OH}$

List-II

(I) Dishwashing powder

(II) Toothpaste

(III) Laundry soap

(IV) Hair conditioner

(A) (A) – (III), (B) – (II), (C) – (IV), (D) – (I)

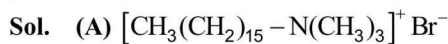
(B) (A) – (IV), (B) – (II), (C) – (III), (D) – (I)

(C) (A) – (IV), (B) – (III), (C) – (II), (D) – (I)

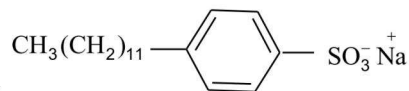
(D) (A) – (III), (B) – (IV), (C) – (I), (D) – (II)

Official Ans. by NTA (B)

Ans. (B)



is cationic detergents used in hair conditioner



(B)

Is anionic detergent used in tooth pastes

(C)  $\text{C}_{17}\text{H}_{35}\text{COO}^- \text{Na}^+ + \text{Na}_2\text{CO}_3 + \text{Rosinate}$  is used as laundry soap

(D)  $\text{CH}_3(\text{CH}_2)_{16}\text{COO}(\text{CH}_2\text{CH}_2\text{O})_N\text{CH}_2\text{CH}_2\text{OH}$  is non-ionic detergents formed from stearic acid and poly ethylene glycol used as liquid dishwashing detergents

### SECTION-B

1. Metal deficiency defect is shown by  $\text{Fe}_{0.93}\text{O}$ . In the crystal, some  $\text{Fe}^{2+}$  cations are missing and loss of positive charge is compensated by the presence of  $\text{Fe}^{3+}$  ions. The percentage of  $\text{Fe}^{2+}$  ions in the  $\text{Fe}_{0.93}\text{O}$  crystals is \_\_\_\_\_. (Nearest integer)

**Official Ans. by NTA (85)**

**Ans. (85)**

- Sol. In  $\text{Fe}_{0.93}\text{O}$  for every 93 Fe ions 14 are  $\text{Fe}^{+3}$  and  $(93 - 14) = 79$  are  $\text{Fe}^{+2}$  ions

$$\therefore \% \text{Fe}^{+2} = \frac{79}{93} \times 100 = 84.9\%$$

$$\therefore \text{nearest integer} = 85\%$$

2. If the uncertainty in velocity and position of a minute particle in space are,  $2.4 \times 10^{-26} \text{ (ms}^{-1}\text{)}$  and  $10^{-7} \text{ (m)}$  respectively. The mass of the particle in g is \_\_\_\_\_ (Nearest integer)

$$\text{(Given : } h = 6.626 \times 10^{-34} \text{ Js)}$$

**Official Ans. by NTA (22)**

**Ans. (22)**

Sol.  $\Delta V = 2.4 \times 10^{-26} \text{ ms}^{-1}$

$$\Delta x = 10^{-7} \text{ m}$$

$$\therefore \Delta p \cdot \Delta x = \frac{h}{4\pi}$$

$$\therefore m \Delta V \cdot \Delta x = \frac{h}{4\pi}$$

$$\Rightarrow m \times 2.4 \times 10^{-26} \times 10^{-7} = \frac{6.626 \times 10^{-34}}{4 \times \pi}$$

$$m = \frac{6.626}{9.6 \times \pi} \times 10^{-1}$$

$$m = 0.02198 \text{ kg}$$

$$m = 21.98 \text{ gm}$$

$$\text{nearest integer} = 22$$

3. 2g of a non-volatile non-electrolyte solute is dissolved in 200 g of two different solvents A and B whose ebullioscopic constants are in the ratio of 1 : 8. The elevation in boiling points of A and B are in the ratio  $\frac{x}{y}$  (x : y). The value of y is \_\_\_\_\_ (Nearest integer)

**Official Ans. by NTA (8)**

**Ans. (8)**

Sol. Given :  $\frac{(K_b)_A}{(K_b)_B} = \frac{1}{8}$

$$\therefore \frac{(\Delta T_B)_A}{(\Delta T_B)_B} = \frac{(K_b)_A \cdot m}{(K_b)_B \cdot m} = \frac{1}{8} = \frac{x}{y}$$

$$\therefore \frac{x}{y} = \frac{1}{8}$$

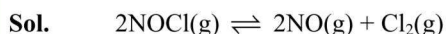
$$\therefore y = 8 \text{ (nearest integer)}$$

4.  $2\text{NOCl(g)} \rightleftharpoons 2\text{NO(g)} + \text{Cl}_2\text{(g)}$

In an experiment, 2.0 moles of NOCl was placed in a one-litre flask and the concentration of NO after equilibrium established, was found to be 0.4 mol/L. The equilibrium constant at  $30^\circ\text{C}$  is \_\_\_\_\_  $\times 10^{-4}$ .

**Official Ans. by NTA (125)**

**Ans. (125)**



$$t=0 \quad 2\text{M} \quad \quad \quad - \quad \quad -$$

$$t=t_{\text{eq}} \quad (2-x)\text{M} \quad \quad \quad x \text{ M} \quad \quad \frac{x}{2} \text{ M}$$

$$\therefore x = 0.4 \text{ M}$$

$$\therefore [\text{NOCl}]_{\text{eq}} = 1.6 \text{ M}$$

$$[\text{NO}]_{\text{eq}} = 0.4 \text{ M}$$

$$[\text{Cl}_2]_{\text{eq}} = 0.2 \text{ M}$$

$$\Rightarrow K_c = \frac{[\text{NO}]^2[\text{Cl}_2]}{[\text{NOCl}]^2} = \frac{[0.4]^2[0.2]}{[1.6]^2}$$

$$K_c = \frac{32}{2.56} \times 10^{-3}$$

$$K_c = 12.5 \times 10^{-3}$$

$$K_c = 125 \times 10^{-4}$$

Integer answer is 125

5. The limiting molar conductivities of NaI, NaNO<sub>3</sub> and AgNO<sub>3</sub> are 12.7, 12.0 and 13.3 mS m<sup>2</sup> mol<sup>-1</sup>, respectively (all at 25°C). The limiting molar conductivity of AgI at this temperature is \_\_\_\_\_ mS m<sup>2</sup> mol<sup>-1</sup>

**Official Ans. by NTA (14)**

**Ans. (14)**

**Sol.** Given

$$(1) \lambda_m^\infty (\text{NaI}) = 12.7 \text{ mS m}^2 \text{ mol}^{-1}$$

$$(2) \lambda_m^\infty (\text{NaNO}_3) = 12.0 \text{ mS m}^2 \text{ mol}^{-1}$$

$$(3) \lambda_m^\infty (\text{AgNO}_3) = 13.3 \text{ mS m}^2 \text{ mol}^{-1}$$

$$\lambda_m^\infty (\text{Ag I}) = (1) + (3) - (2)$$

$$= 12.7 + 13.3 - 12.0$$

$$= 26.0 - 12.0$$

$$\lambda_m^\infty (\text{Ag I}) = 14.0$$

6. The rate constant for a first order reaction is given by the following equation:

$$\ln k = 33.24 - \frac{2.0 \times 10^4 \text{ K}}{T}$$

The Activation energy for the reaction is given by \_\_\_\_\_ kJ mol<sup>-1</sup>. (In Nearest integer)

(Given: R = 8.3 J K<sup>-1</sup> mol<sup>-1</sup>)

**Official Ans. by NTA (166)**

**Ans. (166)**

**Sol.**  $\ln k = \ln A - \frac{E_A}{RT}$

Given:  $\ln k = 33.24 - \frac{2.0 \times 10^4}{T}$

$\therefore$  on comparing  $\frac{E_A}{R} = 2.0 \times 10^4$

$\therefore E_A = 2.0 \times 10^4 \times R$

$\Rightarrow E_A = 2.0 \times 10^4 \times 8.3 \text{ J}$

$\Rightarrow E_A = 16.6 \times 10^4 \text{ J} = 166 \text{ kJ}$

7. The number of statement(s) correct from the following for copper (at no. 29) is/are \_\_\_\_\_

- (A) Cu(II) complexes are always paramagnetic  
 (B) Cu(I) complexes are generally colourless  
 (C) Cu(I) is easily oxidized  
 (D) In Fehling solution, the active reagent has Cu(I)

**Official Ans. by NTA (3)**

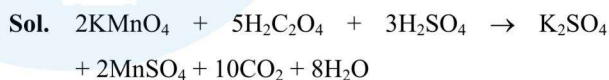
**Ans. (3)**

**Sol.** A,B,C are correct and D is incorrect because Fehling solution has Cu(II)

8. Acidified potassium permanganate solution oxidises oxalic acid. The spin-only magnetic moment of the manganese product formed from the above reaction is \_\_\_\_\_ B.M. (Nearest Integer)

**Official Ans. by NTA (6)**

**Ans. (6)**



Mn<sup>2+</sup> has 5 unpaired electrons therefore the magnetic moment is  $\sqrt{35}$  BM



9. Two elements A and B which form 0.15 moles of  $A_2B$  and  $AB_3$  type compounds. If both  $A_2B$  and  $AB_3$  weigh equally, then the atomic weight of A is \_\_\_\_\_ times of atomic weight of B.

**Official Ans. by NTA (2)**

**Ans. (2)**

**Sol.** Given : Molar mass of  $A_2B = AB_3$

$$\therefore (2A + B) = (A + 3B) \begin{cases} A \rightarrow \text{Atomic wt. of A} \\ B \rightarrow \text{Atomic wt. of B} \end{cases}$$

$$\Rightarrow A = 2B$$

$\therefore$  atomic wt. of A is 2 times of atomic wt. of B

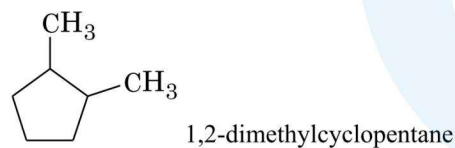
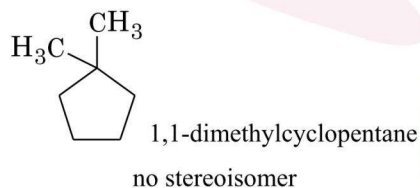
Integer answer is 2

10. Total number of possible stereoisomers of dimethyl cyclopentane is \_\_\_\_\_

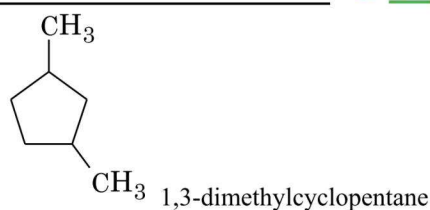
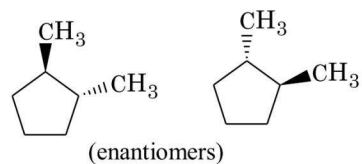
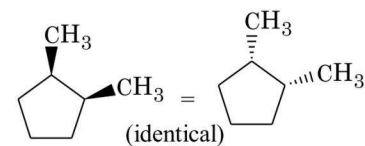
**Official Ans. by NTA (5)**

**Ans. (6)**

**Sol.** Dimethyl cyclopentane



will show stereo isomerism, Its stereo isomers are



will show stereo isomerism, Its stereo isomers are

